

Taxonomic Studies of *Fimbristylis* (Cyperaceae) in Northern Australia

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Abstract

Latz, P.K. Taxonomic studies of *Fimbristylis* (Cyperaceae) in northern Australia. Nuytsia 7(2): 161-182 (1990). The following new species are described: *Fimbristylis arnhemensis*, *F. blakei*, *F. caloptera*, *F. carolinii*, *F. composita*, *F. dunlopii*, *F. laxiglumis*, *F. rupestris* and *F. simulans*. *F. allenii* Turrill, *F. oligocephala* W. Fitzg. and *F. stellata* S.T. Blake are relegated to synonymy under *F. furva* R. Br., *F. cephalophora* F. Muell and *F. schultzei* Boeck, respectively. Problems with several other species are discussed. A key to Australian species is presented.

Introduction

Fimbristylis Vahl is a large world-wide genus of predominantly tropical distribution. In Australia it is more or less restricted to northern tropical and sub-tropical areas. S.T. Blake contributed much to our understanding of the Queensland species, so in this paper I concentrate mostly on the more westerly members of the genus. Much more research is required on this poorly collected but large and difficult group, especially in regard to the species occurring in Western Australia and also in regard to its generic limits.

Description of New Species

1. *Fimbristylis arnhemensis* Latz, sp. nov. (Figure 1)

Fimbristylis subaristatae Benth. affinis sed nuce sine costis prominentibus, stylo glabro absque base bulbosa, bracteis involueralibus brevioribus, et absentia spicularum disticharum basaliu differt.

Typus: Deaf Adder Gorge (13° 02' S, 132° 57' E), Northern Territory, 21 February 1977, C.R. Dunlop 4333, (holo: DNA; iso: BRI, CANB n.v., NT). Sandy soil on rocky ledge on sandstone escarpment.

Annual with fibrous roots. *Stems* densely tufted, setaceous, angular, smooth or hispidulous-scabrid just below the inflorescence, 2.5-16 cm x 0.25-0.4 mm. *Leaves* basal, c. half the length of the stems or shorter, erect, flattened or with margin inrolled, glabrous, abruptly terminating in an acute point, 0.4-0.7 mm wide; ligule absent, sheaths stramineous, glabrous or with minute fringe of hairs on the upper margin. *Inflorescence* simple to decomposed, consisting of (1-)2-9 spikelets; the rays up to 2 cm long. *Involucral bracts* 1-4, glume-like, mucronate or filiform, to 13 mm long. *Spikelets* solitary, lanceolate, subterete, acute, 6-20-flowered, 4.5-8.0 x 1.0-1.5 mm, rachilla broadly winged. *Glumes* spirally arranged, thinly membranous, erect, ovate-lanceolate, acute, glabrous; lower glumes shortly mucronate, the mucro often slightly recurved; upper glumes mucicous, keeled, with 1 or 2 nerves on either side of central nerve, reddish brown except for the broad hyaline margins, 2.0-3.0 x 1.0-1.5 mm. *Stamens* 2-3; anthers linear, 0.5-1.3 mm long. *Style* slender, glabrous, slightly thickened at base, 1.0-2.5 mm long; stigmas 3, shorter than style. *Nut* obtusely trigonous, obovoid, obscurely tricolostulate, shortly stipitate, umbonulate, tuberculate, stramineous, 0.5-0.8 x 0.3-0.4 mm; epidermal cells obscure.

Other specimens examined. NORTHERN TERRITORY: ESE of Mudginberry (12° 36' S, 132° 58' E), 19 Feb. 1973, C.R. Dunlop 3290 (BRI, CANB n.v., DNA, NT); Magela Creek (12° 40' S, 133° 03' E), 25 Feb. 1973, C.R. Dunlop 3362 (BRI, DNA, NSW n.v., NT); Deaf Adder Gorge (13° 02' S, 132° 57' E), 21 Feb. 1977, C.R. Dunlop 4466 (BRI, DNA, NT); Mt Brockman (12° 45' S, 132° 53' E), Feb. 1978, C.R. Dunlop 4680 (BRI, DNA, K n.v., NT); Arnhem Land (12° 55' S, 135° 23' E), 17 June 1972, P.K. Latz 3546 (BRI, DNA).

Distribution. This species appears to be restricted to the sandstone escarpments in western Arnhem Land, Northern Territory.

Habitat. Restricted to well-watered sandy soils on upper areas of sandstone escarpments.

Affinities. *Fimbristylis arnhemensis* is closely related to *F. subaristata* but can be distinguished by its smaller, less prominently ribbed, pale nuts, glabrous style lacking a bulbous base, shorter involucral bracts and the absence of distichous basal spikelets.

Conservation status. Although having a restricted distribution, this species does not appear to be rare or threatened.

Etymology. The specific epithet refers to the localised distribution of this taxa in the Arnhem Land region.

2. *Fimbristylis blakei* Latz, sp. nov. (Figure 1)

Fimbristylis denudatae R. Br. affinis spiculis grandioribus multioribus squarrosis, nucce rotundiore, glumis glandibus rubris dispersis differt; a speciebus affinibus foliis reductis et glumis valde carinatis recedit.

Typus: Davenport Ranges, Northern Territory, 23 Sept. 1983, P.K. Latz 9767 (holo: DNA; iso: BRI, NSW, PERTH). Spreading perennial. Restricted to area of springs at base of quartzite cliff. Precise locality withheld.

Glabrous *perennial* with short rhizome. *Stems* erect or spreading, densely tufted, somewhat flattened above, striate, 8-50 cm x 0.6-1.2 mm. *Cauline* leaves reduced to 1-2(3) bladeless, tubular, obliquely truncate, cinnamomeous-margined sheaths, the uppermost up to 10 cm long; juvenile plants with several subterete (up to 2.5 cm long) leaves which are soon lost; ligule absent. *Inflorescence* simple, rarely subcompound, with (1) 3-4 (9) spikelets, up to 3 cm long. *Involucral* bracts 1-2, glume-like, c. 3 mm long. *Primary rays* 0-6, generally erect, compressed, striate, up to 3 cm long; secondary rays when present 1-2, up to 1 cm long, rachilla broadly winged. *Spikelets* solitary, narrowly ovoid, angular, acute, many-flowered, pale reddish-brown, 8-18 x 2-3 mm.

Glumes spirally arranged, erect, ovate-lanceolate, densely reddish gland-dotted with minutely ciliate margins, prominently keeled by the thickened mid-nerve which continues to a 0.3-0.8 mm long recurved mucro; otherwise nerveless and thinly membranous, 3-4 x 1.3-1.8 mm. *Stamens* 3; anthers linear, 1.4-1.5 mm, connective apically produced, bristly at the top. *Style* flat (rarely triquetrous) swollen at the base, ciliate for whole length, sparsely below, 1.0-1.6 mm long; stigmas 2(3), longer than style. *Nut* biconvex to trigonous, obovate, shortly stipitate, umbonulate, verruculose, stramineous, 1.1-1.2 x 0.9-1.0 mm; epidermal cells inconspicuously quadrangular or transversely oblong.

Other specimens examined (precise locality withheld). NORTHERN TERRITORY: Calvert River, 30 Sept. 1986, P.K. Latz 10375 (BRI, DNA, NT).

WESTERN AUSTRALIA: Ord River, 25 Oct. 1971, D. Kitchener 64 (DNA, PERTH); Hamersley Range, 15 May 1980, M.E. Trudgen 2594 (PERTH).

Distribution. This species is only known from four widely separated locations in the Northern Territory and Western Australia between 16° and 21° S.

Habitat. *F. blakei* appears to be restricted to permanently moist areas in rocky sandstone or quartzite hills.

Affinities. This species has closest affinities with *F. denudata* R. Br. but it differs by the larger, squarrose and more numerous spikelets, more rounded nut and red gland-dotted glumes. It can be separated from other related species by its prominently keeled glumes and the absence of leaves.

Conservation status. Although widespread, *F. blakei* appears to be quite rare. Using the Leigh, Briggs & Hartley (1981) convention, its status should be 3RC. Trampling by stock watering at the springs at which it grows may have already reduced its numbers.

Etymology. The specific epithet honours the late Dr S.T. Blake who contributed so much towards the taxonomy of this genus.

3. *Fimbristylis caloptera* Latz, sp. nov. (Figure 1)

Ex *Fimbristylis cardiocarpa* F. Muell. et speciebus affinis nuce manifeste alata; tantum *F. pterygosperma* R. Br. nuce alata affinis sed specierum australiensium proprietas ceteris, differt.

Typus: East Alligator River (12° 32' S, 133° 09' E), Northern Territory, 16 February 1973, C.R. Dunlop 3269 (holo: DNA; iso: AD, BRI, CANB, K, L, MEL, NT, NSW, PERTH). Lateritic soil [on] edge [of] *E[ucalyptus] miniata* forest.

Annual. *Stems* tufted, terete or somewhat angular, deeply grooved, scabrid, 5-26(40) cm x 0.4-0.7 mm. *Leaves* basal, much shorter than the stems, erect or spreading, subterete, ciliate on margins, 0.3-0.7 mm wide; ligule absent, sheaths with broad hyaline margins about 1 mm wide, white above, somewhat red gland-dotted below. *Inflorescence* a single terminal spikelet. *Spikelet* erect, lanceolate to ovoid, terete to somewhat flattened, acute, many-flowered, reddish-brown, 7-20 x 2-4 mm, rachilla narrowly winged. *Glumes* spiral, subchartaceous, ovate to oblong, obtuse to somewhat acute, muticous, with single nerve slightly thickened and keeled near apex, densely red gland-dotted and minutely appressed-puberulous in the apical part, rarely sub-glabrous, 4.5-6.5 x 2.0-3.5 mm; lower 2-5 glumes shorter, empty, shortly mucronate. *Stamens* 3; anthers linear, 1.5-2.5 mm long, connective apically produced, ciliate at apex, 0.3-0.3 mm. *Style* slender, compressed triquetrous, slightly thickened and somewhat rounded at base, ciliate in upper half but sometimes almost glabrous, 2.8-5.0 mm long; stigmas 3, shorter than the style. *Nut* broadly winged, wings deeply invaginated with ciliate, hyaline margins, 5-7 lobes on either side, sometimes also similarly winged on the third angle; body of nut compressed trigonous, obovoid, stipitate, not or hardly

umbonulate, stramineous or whitish, 3.0-4.5 x 2.5-4.0 mm (including wings); epidermal cells isodiametric in vertical rows.

Other specimens examined. NORTHERN TERRITORY: 16 miles [24 km] NE of Katherine (14° 18' S, 132° 05' E), 25 March 1974, *N. Forrester* 69 (DNA); Gunn Point (12° 09' S, 130° 58' E), 7 May 1973, *J. McKean* 1101 (CANB n.v., DNA); 0.5 miles [0.8 km] NW of Edith River Siding (14° 11' S, 132° 01' E), 30 Jan. 1965, *I.B. Wilson* 211 (CANB n.v., DNA).

Distribution. This species appears to be restricted to an area east and south-east of Darwin, Northern Territory.

Habitat. Either occurring in lateritic or granitic, gravelly soils.

Affinities. The only other Australian species which has similarly winged nuts is *F. pterygosperma* R. Br. but it is quite different in other parts. *F. caloptera* is related to *F. cardiocarpa* F. Muell. and its allies, all of which have wingless nuts.

Conservation status. Unknown, but probably not particularly rare.

Etymology. The specific epithet refers to the attractive wings bordering the nut.

4. *Fimbristylis carolinii* Latz, sp. nov. (Figure 1)

Species nova spiculis grandibus multifloribus notabilis; *Fimbristylis pterygosperma* R. Br. aemulans nucem exalata, foliis equitantibus, basi styli incrassata pyramidalis et partibus omnibus grandioribus differt.

Typus: N of Maggieville on Myravale road, Queensland, 20 April 1974, *R.C. Carolin* 8773, (holo: DNA; iso: NSW). Box woodland. Sandy loam. Precise locality withheld.

Glabrous annual. Stems densely tufted, erect, somewhat flattened below, becoming terete above, sulcate, 30-55 cm x 1.0-1.8 mm, the base clothed with laterally compressed, acuminate or shortly laminate, up to 11 cm long sheaths. Leaves much shorter than the stems, strongly laterally compressed, equitant, striate, without prominent mid-nerve, about 1-2 mm wide; ligule absent. Inflorescence consisting of a single terminal spikelet. Spikelet erect, ebracteate, broadly ovoid to obovoid, obtuse, very densely many-flowered, stramineous 10-25 x 6-8 mm; rachilla winged. Glumes spiral, closely imbricate, membranous, oblong-ovate or oblong, obtuse with rounded apex, muticous, concave, 3-nerved, 4.0-4.5 x 3 mm. Stamens 3; anthers linear, 2-3 mm long. Style triquetrous, pyramidally thickened at base, long hyaline-fimbriate on upper 1/4 otherwise glabrous, 3-4 mm long; stigmas 3, shorter than the style. Nut trigonous, turbinate, abruptly narrowed in lower half, with 3 ridges just above the small stipe, rugulose, umbonulate, greyish-white or greyish-brown, 1.3-1.5 x 1.0-1.3 mm, epidermal cells hexagonal.

Distribution. *F. carolinii* is presently only known from the type location near the Gulf of Carpentaria, Queensland.

Habitat. See *Typus* above.

Affinities. This species is similar to *F. pterygosperma* R. Br. but it lacks the winged nut (although this is also sometimes absent in depauperate *F. pterygosperma* specimens), is larger in all parts, has equitant leaves and a different style. The large, many-flowered spikelets are unique in Australian species of *Fimbristylis*.

Conservation status. Not known, but probably rare, so under the Leigh, Briggs & Hartley (1981) convention its status should be IK.

Etymology. The specific epithet honours Prof. R.C. Carolin, who collected the only known specimen and who has contributed much towards our knowledge of the Australian Flora.

5. *Fimbristylis composita* Latz, sp. nov. (Figure 1)

Affinis arte *Fimbristylis arthrotyloides* W. Fitzg. sed partibus omnibus parvioribus et spiculis plus differt, *F. thouarsii* (Kunth) Merr. aemulans sed glumis spiralibus, nucibus grandioribus, stylo longiore et bracteis involueralibus latioribus recedit.

Typus: Radon Creek area, 12 km S of Jabiru (12° 45' S, 132° 54' E), Northern Territory, 10 June 1978, P.K. Latz 7686 (holo: DNA; iso: NT). Erect perennial. Often dominant, in sand with *Eriachne trisetata*.

Leafless perennial with short rhizome, roots woolly-tomentose. Stems densely tufted, terete but deeply grooved, densely scabrid to smooth, (10) 77-155 cm x (0.35) 0.5-1.5 mm; at first erect then drooping. Leaves reduced to 2-3 bladeless sheaths, the lower ones terminating in a short mucro, the upper with hyaline margins for c. 1 cm before terminating in a short mucro c. 0.2 mm long, often several short, broad stramineous bracts present at base. Inflorescence capitate, depressed globular or hemispherical with (6) 20-50 spikelets, up to 1 cm in diameter but sometimes much reduced (rarely to a single fully developed spikelet). Involucral bracts numerous, 10-40, up to 8 mm long, scabrid, the outer 2 flattened (0.2-0.3 mm broad), the inner ones becoming setaceous. Spikelets sessile, eventually falling off as a whole, somewhat compressed, acute, apparently consistently 1-flowered, 4.5-5.5 mm long, c. 1 mm wide. Glumes 5(6), spirally arranged, lanceolate, with 3-nerved keel and nerveless hyaline margin, at first green on the keel and white on the margin; eventually stramineous or light-brown, the lowest 3 awned, scabrid above, the 2 uppermost acute and mostly glabrous. Glume 1 (the lowest); 2.5-3.6 mm long, c. 0.5 mm wide, tapering into a 1.0-1.6 mm long awn, scabrid on upper half. Glume 2; 3.0-3.6 mm long, c. 1.0 mm wide, tapering into a 1.2 mm long awn, scabrid on upper 1/3. Glume 3; 3.5-4.5 mm long, c. 1.5 mm broad, with a 1 mm long awn, scabrid on upper half. Glume 4; 4-5 mm x 1.5-2.2 mm, acute. Glume 5 (fertile glume); 3.5-4.5 x 1.5-2.0 mm, acute; this and glume 4 with minutely ciliolate margins or glabrous. Stamens 3, anthers linear with 0.5-0.7 mm long glabrous terminal point, 3.0-3.5 mm long and c. 0.3 mm wide. Style triquetrous, thickened at base, shortly ciliate on upper half, 4-6 mm long, stigmas 3, ciliolate, about half the length of the style. Nut obtusely trigonous or almost rounded, ellipsoid or obovoid, conspicuously stipitate, scarcely umbonulate, rugulose, pale-brown to silvery-grey, 1.8-3.0 by 1.0-1.2 mm including the 0.5-0.7 mm long stipe, which is brown to yellow-brown.

Selected specimens from 21 collections examined. NORTHERN TERRITORY: Kathering Gorge (14° 19' S, 132° 25' E), 13 Oct. 1946, S.T. Blake 17212 (BRI, DNA); Adelaide River (13° 20' S, 131° 05' E), 26 Jan. 1972, N. Byrnes 2476 (CANB n.v., DNA, NT); 44 km SE of Oenpelli (12° 34' S, 133° 23' E), 15 June 1978, P.K. Latz 7797 (DNA, NT); Edith Falls (14° 11' S, 132° 11' E) 18 June 1978, P.K. Latz 7814 (DNA, NSW); U.D.P. Falls (13° 30' S, 123° 30' E), 18 Sept. 1984, P.K. Latz 9950 (DNA, NSW); Nourlangie Rock (12° 57' S, 132° 50' E), 3 May 1972, R. Schodde AE 33 (CANB n.v., DNA, NT).

Distribution and habitat. *F. composita* is restricted to sandstone ranges east and south-east of Darwin, Northern Territory.

Affinities. This species is similar to *F. thouarsii* (Kunth) Merr. but differs by its spiral glumes, larger nuts, longer style and broader involueral bracts. It is probably more closely related to *F. arthrotyloides* W. Fitzg. which is bigger in all parts and has fewer spikelets in the inflorescence. (All three species may be better placed in *Actinoschoenus* Benth).

Conservation status. Although *F. composita* is restricted in distribution, it appears not to be rare or threatened.

Etymology. The specific epithet refers to the composite inflorescence.

6. *Fimbristylis dunlopii* Latz, sp. nov. (Figure 1)

Fimbristylis rectae F. Bail. affinis sed plerumque spiculis numerosioribus, glumis parvioribus, nuc pyriformi, basi styli bulbosa differt; a *F. neilsonii* F. Muell. spiculis paucioribus, vaginis foliorum sine marginibus latis hyalinis distinguitur.

Typus: Tabletop Range, Northern Territory, 19 May 1985, C.R. Dunlop 6782 (holo: DNA; iso: NSW). Annual in white sand in seasonally wet area. Precise locality withheld.

Annual. Stems erect, somewhat flattened, sulcate, minutely and densely scabrid above, becoming glabrous below, 7-57 cm x 0.5-1.0 mm. Leaves shorter than the stems, rather rigid, flat, 8-12-nerved, abruptly terminating into a blunt apex, glabrous but scabrid on margins, up to 23 cm long and (1-) 2-4 mm wide, sheaths with somewhat hyaline margins, gradually narrowing onto the leaf blade, hairy on margins above; upper sheaths up to 12.5 cm long, lower sometimes reduced to bracts; ligule absent. Inflorescence consisting of (1-) 2-3 spikelets, the rays when present 1.8-2.5 mm long. Involucral bracts glume-like, c. 8 mm long. Spikelets solitary, erect, ovoid, somewhat acute, many-flowered, pale-brown, 8-12 x 3.5-5.0 mm; rachilla winged. Glumes spiral, membranous, ovate to ovate-lanceolate, obtuse, with long-ciliate margins, reddish gland-dotted in upper half, 9-11-nerved, 5.0-5.5 x 2.5-3.0 mm, central nerve thickened, greenish, terminating below upper margin, bordered on both sides by a yellowish stripe. Stamens 3; anthers linear, 2.5-3.0 mm long. Style triquetrous, slender but abruptly thickened into the bulbous base, glabrous, becoming twisted, 3.5-4.0 mm long, stigmas 3, about as long as the style. Nut trigonous, pyriform, truncate, abruptly narrowed in lower half, shortly stipitate, umbonulate, tuberculate in upper half, white, 1.5-1.8 x 1.3-1.5 mm; epidermal cells obscure.

Other specimens examined (precise localities withheld). NORTHERN TERRITORY: Darwin area, 11 Feb. 1961, H.S. McKee 8383 (CANB n.v., DNA); near Daly River road, 4 Jan. 1964, C.S. Robinson R101 (DNA); Cox's Peninsula, 27 March 1948, R.L. Specht 62 (BRI, DNA).

Distribution. This species is only known from four collections in the Darwin region of the Northern Territory.

Habitat. Either occurring in moist sandy or skeletal lateritic soils, in *Eucalyptus* open-forest.

Affinities. *F. dunlopii* has affinities with *F. recta* F. Bail. but can be readily separated by the fact that it rarely has solitary spikelets, and by its smaller glumes, pyriform nut (unequally trigonous in *F. recta*) and bulbous style base. *F. dunlopii* also has some affinities to *F. neilsonii* F. Muell. but can be easily separated by the fewer spikelets and the absence of wide hyaline margins on the leaf sheaths.

Conservation status. Unknown, but probably rare.

Etymology. The specific epithet honours Mr Clyde R. Dunlop, whose collections have contributed much to further our understanding of this difficult genus.

7. *Fimbristylis laxiglumis* Latz, sp. nov. (Figure 2)

Ab affinis *Fimbristylis solidifolia* F. Muell. et *F. clavata* S.T. Blake sed partibus omnibus gravioribus, foliis pubescentioribus, glumis marginibus ciliatis distinguenda; a *F. corynocarya* F. Muell. glumis obtusis, nuce laevi, folius eligulatis distinguenda.

Typus: Near Dunmarra Roadhouse, Northern Territory, 20 June 1974, P.K. Latz 5484 (holo: DNA; iso: BRI, L, NT, PERTH). Erect annual. Quite rare in grey cracking clay, *Eucalyptus microtheca* grassland. Precise locality withheld.

Annual. Stems densely tufted, erect, deeply grooved, 4-5-angular, with numerous short fine hairs (especially above), 10-80 cm x 1-4 mm; the base clothed with broad, papery leaf-sheaths. Leaves less than half the length of the stems, somewhat rigid, flat or incurved, striate, acuminate, densely hairy below, less so above, c. 3.0-3.5 mm wide; no ligule. Inflorescence compound or decompound, rather dense with (2) 5-numerous spikelets, about 6 cm long and wide. Involucral bracts 3-5, the lowest shorter than the inflorescence. Primary rays several, erecto-patent, grooved, densely hairy, up to 5.5 cm long. Spikelets solitary, broadly ovoid, ragged below, obtuse, many-flowered, 9-25 x 5-7 mm; rachilla winged. Glumes spiral, chartaceous, becoming reflexed before falling and giving the spikelet a ragged appearance, oblong-ovate, obtuse, mucicous or shortly and bluntly mucronulate, 3.6-4.0 x 2.0-3.0 mm, with strong mid-nerve bordered on both sides by a yellowish stripe, ferruginous or brownish sides and densely ciliate margins. Stamens 3; anthers linear, 2.0-2.5 mm long. Style triquetrous, slightly thickened at base, sparsely ciliate, 2.0-2.5 mm long; stigmas 3, about as long as the style. Nut obtusely trigonous, narrowly clavate, shortly stipitate, umbonulate, smooth or sparsely verruculose, usually white, 1.0-1.3 x 0.4-0.6 mm; epidermal cells transversely linear.

Other specimens examined (precise localities withheld). NORTHERN TERRITORY: NE of Roper River Mission, May 1921, N.B. Tindale s.n. (DNA, NSW n.v.).

WESTERN AUSTRALIA: Kimberley Research Station, 13 April 1963, P.J. Rijn s.n. (DNA).

Distribution. *F. laxiglumis* apparently occurs occasionally in the Northern Territory and Western Australia between 14° 30' S and 17° S.

Habitat. This species appear to grow only in cracking grey clays, near water.

Affinities. *F. laxiglumis* is related to both *F. solidifolia* F. Muell. and *F. clavata* S.T. Blake but is larger in all parts, has more hairs on its leaves and ciliate glume fringes. It differs from *F. corynocarya* by its obtuse glumes, smooth nut and absence of a ligule.

Conservation status. Although widespread, *F. laxiglumis* appears to be rare. Trampling by stock watering at the water bodies on the edge of which it occurs may be affecting its continued existence. Using the Leigh, Briggs & Hartley (1981) convention its status should be 3R.

Etymology. The specific epithet refers to the ragged appearance of the mature spikelets caused by the reflexed glumes.

8. *Fimbristylis rupestris* Latz, sp. nov. (Figure 2)

Ex *Fimbristylis trachycarya* F. Muell. et specierum affinium, habitu parvo annuo, ligula deficienti, inflorescentia simplici, glumis emarginatis, marginibus distalibus ciliatis glumarum, stylo glabro, nuc subglobosa cellulis epidermidis quinquangularis isodiametris distinguenda.

Typus: Mitchell River (14° 50' S, 125° 42' E), Western Australia, 23 Feb. 1980, C.R. Dunlop 5265, (holo: DNA; iso: NT, PERTH). In shallow, sandy seepage on sandstone pavement.

Erect annual. Stems rigid, somewhat flattened, deeply grooved, glabrous, 8-17 cm x 0.3-0.7 mm. Leaves basal, about half the length of the stems, somewhat recurved, flattened or with margins inrolled, ciliate on margins or glabrous, 5-7-nerved above, gradually narrowing to an acute apex, 3-8 cm x 0.6-1.5 mm; ligule absent; sheaths glabrous, many-nerved with wide hyaline margins, up to 3.5 cm long, rarely reduced to bracts. Inflorescence simple with (1) 2-5 spikelets, 2-5 cm long. Involucral bracts 1-5 with narrow hyaline margins, ciliate on upper margins or glabrous, up to 1.5 cm long; rays spreading, similar to stems. Spikelets solitary, erect, narrowly ovoid, angular, acute, 5-25-flowered, reddish-brown, 5-10 x 2.5 mm; rachilla winged. Glumes spirally arranged, erect, broadly ovate, shortly emarginate, margins membranous, red gland-dotted, forming 2 apical lobes, ciliate in the upper half; 1.8-2.5 x 1.5-1.8 mm, reddish-brown except for greenish central nerve, which is thickened above to continue into a short recurved mucro and is bordered on both sides by a yellowish stripe; lower 2 glumes long mucronate. Stamens (2)3; anthers linear, 0.7-1.0 mm long. Style trigonous, distinctly swollen at the base, glabrous, 0.9-1.2 mm long; stigmas 3, about as long as the style. Nut trigonous, obovate, shortly stipitate, umbonulate, sparsely verruculose, dark brown, 0.8-1.2 x 0.8-1.0 mm, epidermal cells isodiametrically pentagonal.

Other specimens examined. NORTHERN TERRITORY: Cox River Station, Tanumbirini Creek (16° 01' S, 134° 47' E), 11 July 1977, P.K. Latz 7855 (DNA); Echo Gorge area, Wollgorang Station (17° 12' S, 137° 42' E), 9 June 1987, P.K. Latz 10500 (BRI, DNA, NSW, PERTH).

Distribution. *F. rupestris* is presently only known from three locations in the drier tropical areas of Western Australia and the Northern Territory between 14° 30' S and 17° 30' S.

Habitat. This species appears to be restricted to skeletal soil on quartzite or sandstone ranges.

Affinities. *F. rupestris* is closely related to *F. trachycarya* F. Muell. and its allies, but it can be separated by the combination of certain characters; namely being a small annual with eligulate leaves, and having a simple inflorescence and emarginate glumes which are ciliate on the upper margins. It has a glabrous style and a subglobular nut with isodiametrically pentagonal epidermal cells.

Conservation status. There is no reason to suspect that *F. rupestris* is either rare or threatened; the lack of collections is probably due to the paucity of botanical collections in the area in which it occurs and its resemblance to other, more common, members of this genus.

Etymology. The specific epithet refers to the preference of this species for a rocky habitat.

9. *Fimbristylis simulans* Latz, sp. nov. (Figure 2)

Ex *Fimbristylis cardiocarpa* F. Muell. et specierum affinium marginibus latis hyalinis foliorum vaginalium, foliis glabris, nervo centrali glumarum fertilium mucroni procurrenti, nuce obovoidea distinguenda.

Typus: Coodna Waterhole (19° 18' S, 134° 14' E), Phillip Creek Station, Northern Territory, 1 June 1975, P.K. Latz 6015 (holo: DNA; iso: BRI, L, NT). Erect annual. Infrequent in skeletal soil, recently burnt outcrop; *Triodia pungens* and *Eucalyptus leucophloia* open-woodland.

Annual. Stems weak, densely tufted, terete, sulcate, glabrous (rarely sparsely scabrid), few-leaved at the base, 17-30 cm by 0.3-0.6 mm but often reduced and as little as 1 cm tall. Leaves the length of the stems or less, at first somewhat flattened by soon becoming inrolled and terete, scabrid on margins (rarely glabrous), strongly nerved, 0.3-0.6 mm wide; sheaths with wide hyaline margins, wider than central portion of sheath in upper part, abruptly terminated; ligule absent. Inflorescence a single terminal spikelet. Spikelets erect, lanceolate, obovoid, terete, acute, densely many-flowered, pale reddish-brown, 7-27 x 2-4 mm; rachilla winged. Glumes spirally arranged, thinly membranous, erect, ovate-lanceolate, acute, mucronate, not or indistinctly keeled, with single

central nerve and microscopically ciliate margins at the apex, densely reddish gland-dotted, 4.5-6.0 x 1.7-2.2 mm. *Stamens* 3; anthers linear 2.5-3.0 mm long. *Style* slender, glabrous 2.5-4.0 mm; base bulbous; stigmas 3, much shorter than the style, sparsely ciliate. *Nut* trigonous, tricostate, with somewhat convex sides, obovoid to turbinate, shortly stipitate, umbonulate, tuberculate on upper half, shining black at maturity, 1.2-1.5 x 1.2-1.4 mm; epidermal cells obscure, oblong to hexagonal in vertical rows.

Selected specimens from 15 collections examined. NORTHERN TERRITORY: Negri River area (17° 10' S, 129° 15' E), 4 May 1974, *C.R. Dunlop* 4110 (DNA, NT); Tanami Desert (20° 11' S, 129° 43' E), 3 July 1980, *P.K. Latz* 8399 (AD, CANB, DNA, MEL, NSW, PERTH); Frankenia Rise, 9 km W of Rabbit Flat (20° 10' S 129° 53' E), 5 July 1983, *P.K. Latz* 9570 (BRI, DNA, K, NSW).

WESTERN AUSTRALIA: 33 miles [53 km] S of Sturt Creek Homestead (19° 39' S, 128° 12' E), 20 July 1973, *P.K. Latz* 4032 (BRI, CANB, DNA, PERTH); above Dales Gorge, Hamersley Ranges National Park (22° 20' S, 118° 35' E), 8 Aug. 1974, *A.C. Beauglehole* 48607 (DNA, PERTH); 6.5 km NE of Mary River Crossing, Great Northern Highway (18° 41' S, 126° 42' E), 19 June 1976, *A.C. Beauglehole* 43249 (DNA, PERTH); White Mountain Hills, near Ord River Station, East Kimberley (17° 16' S, 128° 58' E), 20 April 1977, *R. Pullen* n.v. (CANB n.v., DNA).

Distribution. *F. simulans* occurs over a wide area of the semi-arid zone of the Northern Territory and Western Australia between 17° and 22° S.

Habitat. This species mostly occurs on gravelly slopes dominated by *Triodia* spp. and *Eucalyptus brevifolia* or *E. leucophloia*. It appears to be most common the first year after fire.

Affinities. *F. simulans* is closely related to *F. cardiocarpa* F. Muell. and its allies but it is characterized by its wide, hyaline, leaf-sheath margins, its glabrous leaves (\pm scabrid on the margins), its fertile glumes with a single central nerve which is produced into a distinct mucro, and its dark obovoid nut.

Conservation status. Not considered rare or endangered.

Etymology. The specific epithet refers to its similarity to the other plants in this difficult group of species with solitary, gland-dotted spikelets.

Comments on other Species

Fimbristylis cephalophora F. Muell., *Fragm.* 1: 196 (1859). *Type:* Upper Victoria River, Northern Territory, *F. Mueller* s.n. (holo: MEL n.v.; iso: BRI, KEW n.v.).

F. oligocephala Fitzg., *Roy. Soc. Western Australia* 3: 120 (1918). *Type:* Packhorse Range, Western Australia, *W.V. Fitzgerald* s.n. (holo: PERTH).

Blake (1969, 7-10) clarified the confusion that occurs between *F. furva* R. Br., *F. capitata* R. Br. and *F. cephalophora* in Bentham (1878). In his description of *F. oligocephala*, Fitzgerald did not provide features that distinguish it from other species. Having examined type material of both of the above species, I am of the opinion that *F. oligocephala* should be considered conspecific with *F. cephalophora*.

Fimbristylis furva R. Br., *Prodr.* 228 (1810) *Type:* Booby Island and Endeavour River, Queensland, *J. Banks & D. Solander* s.n. (holo: BM, fragment n.v. and photo BRI; iso: BRI, MEL n.v.).

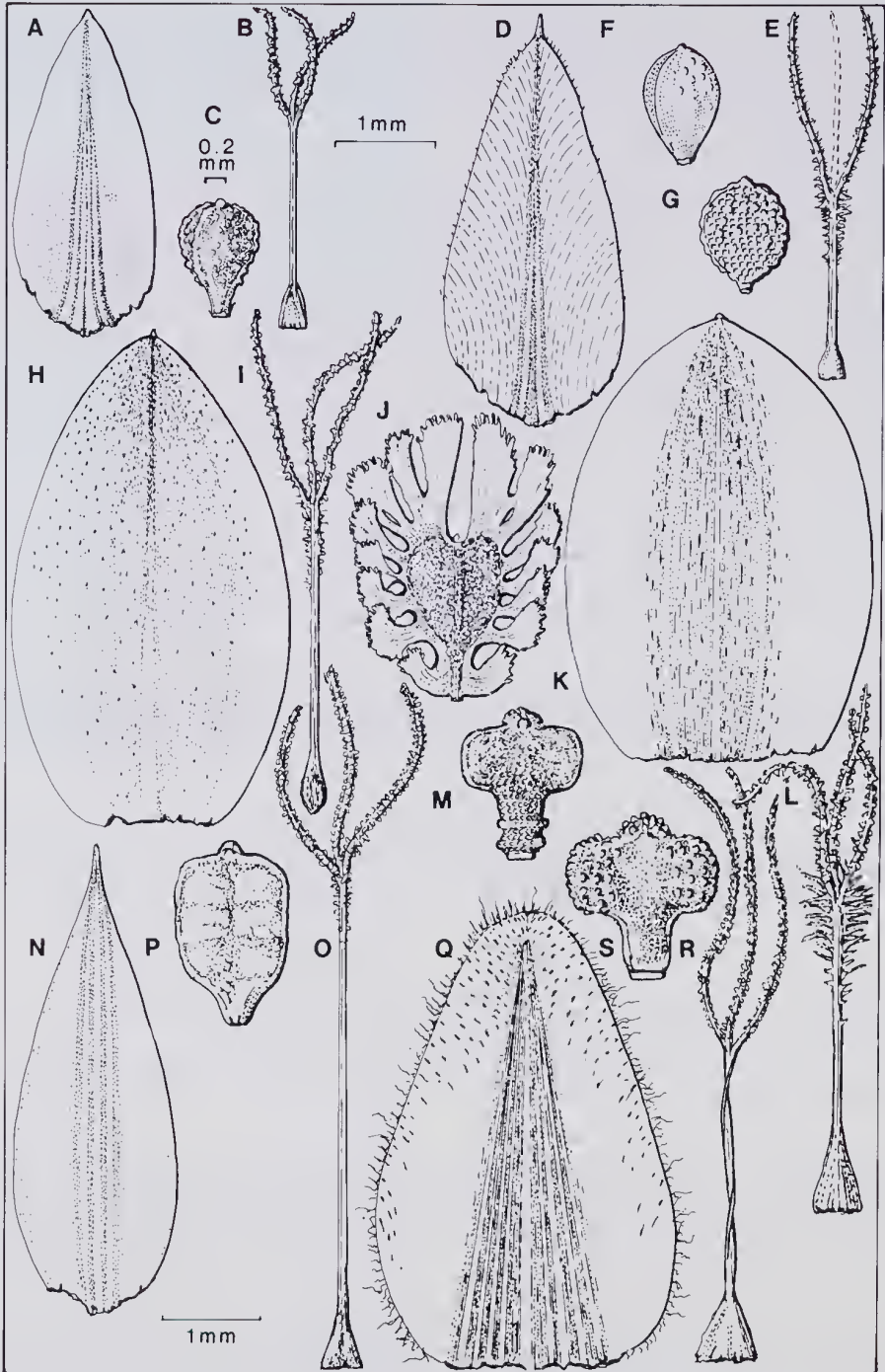


Figure 1. A - B *Fimbristylis arnhemensis* (drawn from C.R. Dunlop 4333). A - Glume. B - Style. C - Nut. D - G *F. blakei* (drawn from P.K. Latz 9767). D - Glume. E - Style. F - Nut. H - J *F. caloptera* (drawn from C.R. Dunlop 3269). H - Glume. I - Style. J - Nut. K - M *F. carolinii* (drawn from R.C. Carolin 8773). K - Glume. L - Style. M - Nut. N - P *F. composita* (drawn from P.K. Latz 7686). N - Glume-4. O - Style. P - Nut. Q - S *F. dunlopii* (drawn from R.L. Specht 62). Q - Glume. R - Style. S - Nut.

F. allenii Turrill, Kew Royal Bot. Gdns. Bull. Misc. Inf. (1915) 117. Type: near Darwin, Northern Territory, C.E.F. Allen 170 (holo: K; iso: NSW).

F. furva is a variable species (Blake 1969). After examination of the type material of both of these species, I consider that *F. allenii* falls well within the range of variation and should be considered conspecific with *F. furva*.

Fimbristylis schulzii Boeck. Linnæa 38 (1874) 391.

F. stellata S.T. Blake, Proc. Roy. Soc. Qld. 58(2): 46 (1947). Type: c. 50 miles NW of Munnyana, Queensland, S.T. Blake 17241 (holo: BRI).

In his description of *F. stellata* Blake (1947) gave what appears to be valid differences between it and *F. schultzei* (but see also Kern 1974: 559-10). On close examination of a large number of collections I have, however, found numerous intermediates and must therefore consider these two species to be conspecific.

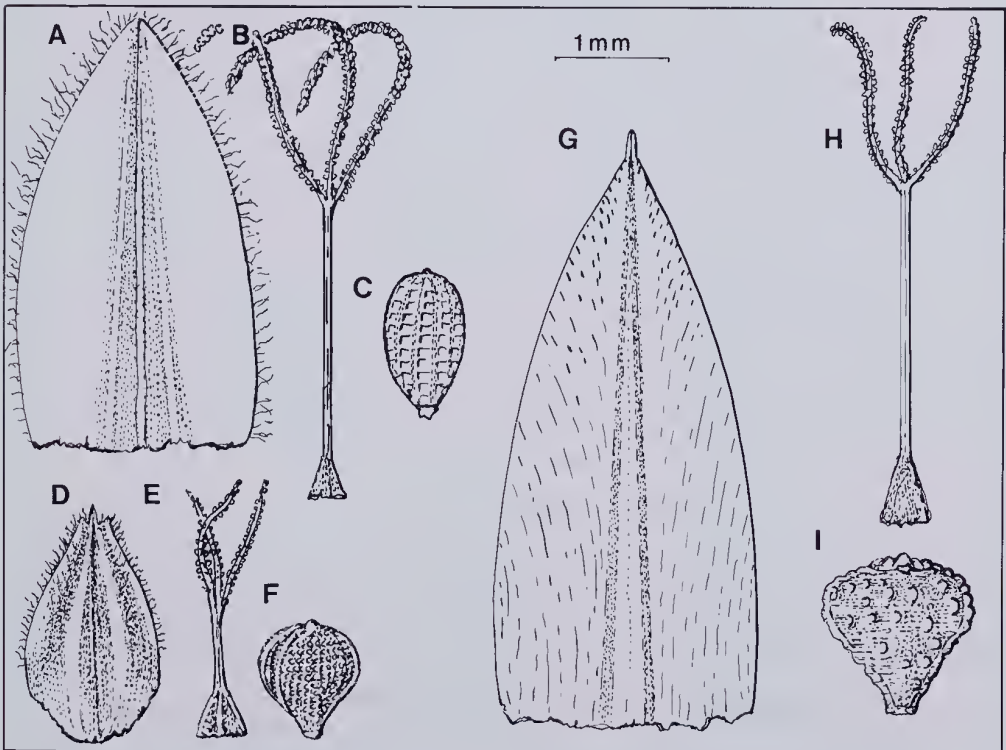


Figure 2. A - C *Fimbristylis laxiglumis* (drawn from P.K. Latz 5484). A - Glume. B - Style. C - Nut. D - *F. rupestris* (drawn from C.R. Dunlop 5265). D - Glume. E - Style. F - Nut. G - I *F. simulans* (drawn from P.K. Latz 6015)

Key to *Fimbristylis* in Australia

A draft key to all the Australian species of *Fimbristylis* has been prepared and is now presented.

Twelve taxa of uncertain affinities are included in the key. Several of these may be better placed in *Actinoschoenus* Benth. or *Trachystylis* S.T. Blake (or even a new genus) but are placed in *Fimbristylis* for convenience, at this stage. Further collections and research are required to clarify the situation.

I have excluded *Fimbristylis rhyticarya* F. Muell. in the key as I agree with Kern (1974) that it should be relegated to synonymy under *F. acuminata* Vahl.

- 1a. Glumes spirally arranged 2
- b. Glumes (at least in young spikelets) distichous; sometimes becoming twisted with age. Spikelets strongly laterally compressed, similar to those in *Cyperus* 114
- 2a. Nut sub-cylindrical, oblong-linear in outline 3
- b. Nut not oblong-linear in outline 4
- 3a. Inflorescence a single terminal spikelet, glumes obtuse, 3-5 mm long *F. tetragona*
- b. Inflorescence compound, glumes mucronate, 1-2 mm long *F. dipsacea*
- 4a. Stigmas 3, nut trigonous or triquetrous..... 5
- b. Stigmas 2, nut biconvex 82
- 5a. Spikelets solitary on the stem 6
- b. Spikelets more than one on each stem 28
- 6a. Nut winged 7
- b. Nut not winged (sometimes with an apical ridge)..... 8
- 7a. Wing rounded, glumes obovate *F. pterygosperma*
- b. Wing divided, glumes lanceolate..... 3. *F. caloptera*
- 8a. Nut with transverse wavy ridges (sometimes obscure in *F. punctata*) 9
- b. Nut smooth or tuberculate, wavy ridges absent, or restricted to lower third of nut..... 11
- 9a. Spikelets 1-2 flowered, nut 2.5-3 mm long *F. sp. A*
- b. Spikelets many flowered, nut less than 2.5 mm long 10
- 10a. Style glabrous 1 mm long, glumes glabrous, 2.5-3.5 mm long *F. ammobia*
- b. Style hairy 2 mm long or more, glumes softly hairy above, 5-6 mm long *F. punctata*
- 11a. Spikelets oblique or at right angles to the stem 12
- b. Spikelets exactly terminal (except *F. trigastrocarya* where the spikelet is sometimes pushed to one side by the involucre bract)..... 14
- 12a. Glume with two terminal wings, glabrous *F. costiglumis*
- b. Glume apices rounded, with ciliate margins 13

- 13a. Glumes less than 3 mm long, leaves glabrous, (except for ciliate margins),
nut less than 1.2 mm long; in sandy soils *F. densa*
- b. Glumes greater than 3 mm long, leaves hairy (often sparsely),
nut greater than 1.2 mm long; in gravelly soils *F. xyridis*
- 14a. Glumes with ciliate margins (sometimes obscure),
conspicuously red gland-dotted, leafy plants with glabrous styles 15
- b. Glumes glabrous, not or inconspicuously gland-dotted, leafy or leafless,
styles glabrous or hairy 23
- 15a. Leaves flat, 2-4 mm wide, glumes greater than 4.5 mm long with thickened
raised mid-nerve, nut pale 16
- b. Leaves incurved or terete, less than 2 mm wide,
other characters not combined 17
- 16a. Nut pyriform, style with large bulbous base 6. *F. dunlopii*
- b. Nut unequally trigonous, style with tapering base *F. recta*
- 17a. Mature nuts white or pale brown, glumes obtuse with a
conspicuous yellowish stripe on either side of the central nerve 18
- b. Mature nuts brown or black, glumes acute, central nerve only conspicuous 20
- 18a. Glumes greater than 3 mm long, stems with fine stiff hairs,
nut 0.9-1.4 mm long, somewhat flattened on back *F. sp. B*
- b. Glumes less than 3 mm long, stem scabrid, nut less than 0.9 mm long,
somewhat rounded on back 19
- 19a. Nut sub-globular, glumes densely overlapping, spikelets obtuse,
style only slightly twisted at maturity *F. sphaecocephala*
- b. Nut obovoid, constricted just below middle, glumes less dense,
spikelet acute, style strongly twisted at maturity *F. trigastrocarya*
- 20a. Fertile glumes mucronate, nerve tip extending well past glume margin,
leaf sheaths with wide conspicuous hyaline margins, leaves scabrid on
margins or smooth 9. *F. simulans*
- b. Fertile glumes acute, nerve tip not extending past glume margin,
if leaf sheaths with wide conspicuous hyaline margins then leaves hairy 21
- 21a. Nut 3-lobed, sub-globular, foliage densely scabrid *F. leucocolea*
- b. Nut not 3-lobed, flattened on back, foliage sparsely scabrid 22
- 22a. Glumes greater than 4.7 mm long, nut broadly ovate to euneate,
usually tuberculate, epidermal cells hexagonal or isodiametric *F. cardiocarpa*
- b. Glumes less than 4.7 mm long, nut obovate, smooth, epidermal cells
conspicuously transversely oblong in vertical rows on each face *F. sp. C*
- 23a. Nut abruptly constricted above base, style either with hyaline margin or
dense tuft of hairs in upper portion, spikelets generally greater than 5 mm wide 24
- b. Nut gradually narrowed below, style glabrous or sparsely ciliate,
spikelets less than 5 mm wide 25

- 24a. Nut about as wide as broad, style greater than 2.7 mm long,
leaves equitant 4. *F. carolinii*
- b. Nut flattened, style less than 2.7 mm long, leaves not equitant *F. pterygosperma*
- 25a. Glumes acute, usually greater than 3 mm long, lowest
(empty) glume more than half as long as spikelet..... 26
- b. Glumes obtuse, usually less than 3 mm long, lowest glume
less than half the length of the spikelet..... 27
- 26a. Style 3-5 mm long, leaf sheaths disintegrating into fine
reticulate (herring bone) fibres, glumes 1 nerved *F. dictyocolea*
- b. Style 1.5-3 mm long, leaf sheaths not as above,
glumes obscurely several nerved *F. pauciflora*
- 27a. Stamens 3, glumes greater than 2 mm long, perennial *F. simplex*
- b. Stamens 1(-2), glumes less than 2 mm long, annual *F. modesta*
- 28a. Spikelets all, or majority, solitary 29
- b. Spikelets all, or majority, clustered (in a eomposite head, or heads) 71
- 29a. Mature spikelets greater than 3.8 mm wide 30
- b. Mature spikelets less than 3.8 mm wide..... 37
- 30a. Style glabrous, upper stems scabrid 31
- b. Style hairy, upper stems glabrous or clothed with fine dense hairs 33
- 31a. Style less than 2.5 mm long, nut not tuberculate
(its cells transversely lineolate), glumes less than 3.5 mm long *F. clavata*
- b. Style greater than 2.5 mm long, mature nut tuberculate,
glumes greater than 3.5 mm long 32
- 32a. Glume fringes long-ciliolate, spikelets generally less than
4 per head, leaves smooth, sheaths without wide hyaline margins 6. *F. dunlopia*
- b. Glumes fringes shortly ciliolate or glabrous, spikelets generally
more than 4 per head, leaves scabrid with wide hyaline margins *F. neilsonii*
- 33a. Glume fringes ciliolate whole length, involueral braets hairy 34
- b. Glume fringes glabrous or ciliolate on upper margins,
involueral braets glabrous or with ciliate margins 35
- 34a. Glume with nerve continuing past tip which is usually reflexed,
mature nut tuberculate, distinct ligule present *F. corynocarpa*
- b. Glume not mucronate, mature nut smooth or sparsely verruculose,
distinct ligule absent 7. *F. laxiglumis*
- 35a. Style greater than 3 mm long, winged above, glumes sharply acute *F. insignis*
- b. Style less than 3 mm long, not winged above, glumes obtuse 36
- 36a. Nut clavate, style less than 1.3 mm long, glumes glabrous *F. solidifolia*

- b. Nut rounded, style generally greater than 1.3 mm long,
glumes minutely ciliolate on upper margins *F. rara*
- 37a. Style glabrous 38
- b. Style hairy (sometimes only at base) 57
- 38a. Style either less than 1 mm long or glumes less than 1.9 mm long,
or both (*F. cymosa*, *F. littoralis* and *F. rupestris* are often
intermediate and key both ways) 39
- b. Style greater than 1 mm long, glumes greater than 1.9 mm long 46
- 39a. Perennial with stiff leaves *F. cymosa*
- b. Annuals with soft leaves 40
- 40a. Spikelets sub-globular, leaves equitant or spongy 41
- b. Spikelets acute and ragged, leaves flat or absent 42
- 41a. Stamens 3, nut obovate, glume fringes ciliolate at apex *F. rara*
- b. Stamens 1-2, nut clavate, glume fringes glabrous *F. littoralis*
- 42a. Inflorescence simple with less than 7 spikelets,
nut epidermal cells isodiametric 8. *F. rupestris*
- b. Inflorescence compound with more than 7 spikelets,
nut epidermal cells transversely linear 43
- 43a. Ligule present, nerves on leaves several, not raised or thickened *F. microcarya*
- b. Ligule absent, leaves with prominent mid-rib and rib-like margins 44
- 44a. Underside of leaves ciliate (especially in lower part),
glume fringes ciliolate at apex 45
- b. Underside of leaves glabrous, glumes glabrous *F. miliacea*
- 45a. Fertile glumes mucronate with narrow hyaline margin,
stems less than 1 mm wide *F. elegans*
- b. Fertile glumes obtuse with wide hyaline margins,
stems more than 1 mm wide *F. trachycarya*
- 46a. Perennials with stiff leaves 47
- b. Annuals with soft leaves 50
- 47a. Ligule present, stems flattened 2-3 mm wide *F. complanata*
- b. Ligule absent, stems rounded or angled 48
- 48a. Glumes greater than 2.8 mm long, spikelets sub-distichous,
greater than 2 mm wide *F. eragrostis*
- b. Glumes less than 2.8 mm long, spikelets spirally arranged,
less than 2 mm wide 49
- 49a. Glumes with 0.4 mm long awn *F. sp. D*
- b. Glumes obtuse *F. cymosa*

- 50a. Stems flattened, nut smooth but with deeply sculptured cells *F. micans*
 b. Stems terete or angled, mature nuts tuberculate or ridged 51
- 51a. Nut with 7-10 coarse transverse ridges *F. ammobia*
 b. Nut without transverse ridges 52
- 52a. Style 3-4 mm long, glumes 4-5 mm long *F. sp. F*
 b. Style less than 3 mm long, glumes less than 3.5 mm long 53
- 53a. Fertile glumes sharply acute or awned, 2-3 mm long 54
 b. Fertile glumes obtuse, muticate, generally less than 2.6 mm long 56
- 54a. Glumes ciliate on upper margin, nut epidermal cells transversely lineolate *F. sp. F*
 b. Glumes glabrous, nut cells not transversely lineolate 55
- 55a. Mature nut white or stramineous, less than 0.5 mm wide 1. *F. arnhemensis*
 b. Mature nut dark brown, greater than 0.5 mm wide *F. subaristata*
- 56a. Glumes and spikelets obtuse, stems nerved *F. rara*
 b. Glumes and spikelets acute, stems deeply grooved *F. phaeoleuca*
- 57a. Plants less than 20 cm tall,
 inflorescence simple (spikelets less than 10) 8. *F. rupestris*
 b. Plants greater than 20 cm tall, inflorescence compound
 (spikelets more than 10) 58
- 58a. Glumes less than 2.6 mm long, style less than 2 mm long 59
 b. Glumes greater than 2.6 mm long,
 style generally greater than 2 mm long (if less than glume awned) 66
- 59a. Nut maturing purplish-black, glume margins hairy, style base hairy 60
 b. Mature nuts white or dark brown, other characters not combined 61
- 60a. Glumes acute, style twisted at maturity, glumes subdistichous *F. furva*
 b. Glumes with 2 obtuse lobes, style not twisted,
 glumes spiral *F. macassarensis*
- 61a. Glumes and spikelets obtuse, spikelets 2.5 mm wide *F. rara*
 b. Glumes and spikelets acute,
 spikelets generally less than 2.5 mm wide 62
- 62a. Small annual, stamens 1 (2), glumes less than 1.6 mm long *F. milacea*
 b. Perennials, stamens 3 (2), glumes generally greater than 1.6 mm long 63
- 63a. Rhizomatous or stoloniferous perennials, leaves narrow
 (subterete) with long hairs on lower margins 64
 b. Tufted perennials, leaves flattened or inrolled,
 shortly scabrid on lower margins 65

- 64a. Style ciliate at base, glumes sub-distichous,
rhizotomous plant *F. cinnomometorum*
- b. Style base glabrous, glumes spiral, stoloniferous plant *F. vagans*
- 65a. Style with relatively long conspicuous hairs for most of its length,
nut maturing white; desert plant *F. eremophila*
- b. Style shortly hairy above, nut maturing dark brown; coastal plant *F. cymosa*
- 66a. Fertile glumes with 1-1.5 mm long seabrid awns, leafy annuals *F. signata*
- b. Fertile glumes not awned, perennials or leafy annuals..... 67
- 67a. Small annual with distichous basal spikelets,
apical spikelets 1-5, glumes glabrous *F. spiralis*
- b. Perennials without basal spikelets, apical spikelets generally numerous,
glumes glabrous or hairy 68
- 68a. Glumes ciliate on margins, nuts maturing black 69
- b. Glumes glabrous or minutely ciliolate on margins
(then style base glabrous), mature nuts stramineous or brown 70
- 69a. Style ciliate whole length, glumes less than 3.5 mm long,
spikelets less than 1 cm long *F. furva*
- b. Style ciliate at base only, glumes greater than 3.5 mm long,
spikelets generally greater than 1 cm long..... *F. lanceolata*
- 70a. Leaves flat, glabrous, style winged or ciliate above, tufted plant *F. insignis*
- b. Leaves subterete, hairy on lower margins, style ciliate at base,
glabrous above, rhizotomous plant *F. cinnamometorum*
- 71a. Spikelets capitate 70
- b. Spikelets not capitate (sometimes stunted *F. neilsonii*
appearing capitate) 79
- 72a. Fertile spikelets 1 (-2) flowered, style greater than 2.8 mm long,
nut with spongy attachment on stipe..... 73
- b. Fertile spikelets 2-many flowered, style less than 2.3 mm long,
nut without attachment on stipe 76
- 73a. Spikelets 4-many per head, fertile glumes less than 5 mm long 74
- b. Spikelets 3 or less per head, fertile glumes greater than 5 mm long 75
- 74a. Glumes spiral, style 4 mm long or more,
spikelets all erect or suberect 5. *F. composita*
- b. Glumes sub-distichous, style less than 4 mm long,
outer spikelets becoming reflexed at maturity.....*F. sp. G*
- 75a. Glumes sub-distichous, lowest glume subequal
to spikelets, stems hairy *F. arthrotyloides*
- b. Glumes spiral, lowest glume about one third of length of spikelet,
stems ciliate or glabrous..... *F. sp. H*

- 76a. Underside of leaves and involucre bracts silky-hairy *F. sericea*
 b. Underside of leaves and bracts glabrous or ciliate on margins, or absent 77
- 77a. Fertile glumes sparsely gland-dotted, distinctly awned, nut pyriform to obovoid *F. schultzei*
 b. Fertile glumes densely gland-dotted, central nerve protruding only slightly past tip, nut sub-globular 78
- 78a. Style glabrous or sparsely and shortly ciliate at base, glumes lobed but somewhat acute, lowest glumes glabrous on central nerve *F. cephalophora*
 b. Style densely long ciliate at base, glume with 2 broad lobes at apex, ciliate on central nerve *F. compacta*
- 79a. Leaves densely silky pubescent beneath, glumes pubescent *F. sericea*
 b. Leaves not densely silky pubescent beneath, glumes ciliate on margins only or glabrous 80
- 80a. Glumes greater than 2.2 mm long, ciliate on upper margins, mature nuts usually tuberculate 81
 b. Glumes less than 2.2 mm long, glabrous, mature nut smooth or sparsely verruculose *F. cymosa*
- 81a. Glumes greater than 3.5 mm long, style glabrous, leaves with wide hyaline margins *F. neilsonii*
 b. Glumes less than 3.5 mm long, style hairy, leaves (if present) without wide hyaline margins *F. furva*
- 82a. Nut with transverse, wavy ridges, one spikelet per stem 83
 b. Nut longitudinally striate, finely reticulate, smooth or tuberculate, spikelets usually more than one per stem 91
- 83a. Glumes hairy, or if glabrous, then rest of plant densely hairy 84
 b. Plants glabrous 85
- 84a. Leaves hairy, nut broadly ellipsoid, upper glumes glabrous *F. pilifera*
 b. Leaves scabrid on margins, otherwise glabrous, nut obovate, upper glumes with short fine hairs above *F. punctata*
- 85a. Majority of spikelets nodding 86
 b. Majority of spikelets erect 87
- 86a. Leafless perennial, style greater than 2.6 mm long, usually greater than 0.4 mm wide, glumes greater than 3.3 mm long *F. nutans*
 b. Annuals, usually leafy, style less than 2.6 mm long, usually less than 0.4 mm wide, glumes less than 3.3 mm long *F. sp. 1*
- 87a. Glumes less than 2 mm long, rich red, nut ridges generally 3-4, style base ciliate *F. nuda*
 b. Glumes greater than 2 mm long, pale, nut ridges 4 or more, style base glabrous or ciliate 88

- 88a. Fertile glumes and spikelets broadly obtuse,
nut narrowly and deeply furrowed, furrows generally 5,
leaves conspicuous *F. pallida*
- b. Fertile glumes acute to somewhat obtuse, nut furrows broad and shallow,
generally more than 5, leafless or leaves inconspicuous 89
- 89a. Fertile glumes less than 3.5 mm long *F. sp. J*
- b. Fertile glumes greater than 3.5 mm long 90
- 90a. Mature nut with distinct pale rounded rim at base,
the remainder usually dark brown, lowest glume broadly obtuse,
much shorter than the fertile glumes *F. acuminata*
- b. Mature nut without distinct white rounded rim at base,
usually pale, lowest glume obtuse or acute only slightly
shorter than the fertile glume *F. acicularis*
- 91a. Leaves ligulate (sheaths and blades separated by a distinct
fringe of short hairs or membranous projections) 92
- b. Leave eligulate or plant leafless (irregularly spaced hairs may
be present on upper leaf surface) 101
- 92a. Glumes hairy on back at least in apical part 93
- b. Upper glumes glabrous on back (several lower glumes may have
stiff white hairs on or near central nerve) 95
- 93a. Glumes less than 2.6 mm long,
style less than 1.5 mm long, stamens 2 *F. pubisquama*
- b. Glumes greater than 2.6 mm long, style greater than
1.5 mm long, stamens usually three 94
- 94a. Glumes nearly as broad as long, style about 0.4 mm wide,
involucral bracts usually longer than the inflorescence,
nuts shortly stipitate *F. sieberiana*
- b. Glumes considerably longer than broad, style about 0.25 mm wide,
involucral bracts shorter than the inflorescence, nut distinctly stipitate *F. ferruginea*
- 95a. Nut distinctly longitudinally striate and transversely cancellate (lattice-like) 96
- b. Nut smooth, finely reticulate or verrucose.....98
- 96a. Spikelets less than 2 mm wide, glumes less than 2 mm long *F. bisumbellata*
- b. Spikelets greater than 2 mm wide, glumes greater than 2 mm long 97
- 97a. Perennial, style slender, longer than nut, leaves almost distichous *F. dichotoma*
- b. Annual, style equal or shorter than nut (including stipe), leaves spiral *F. depauperata*
- 98a. Glumes greater than 2 mm long, spikelets greater than 3 mm wide 99
- b. Glumes less than 2 mm long, spikelets less than 3 mm wide..... 100
- 99a. Glumes greater than 4 mm long, style greater than 2 mm long,
anthers greater than 1 mm long..... *F. tristachya*

- b. Glumes less than 4 mm long, style less than 2 mm long,
anthers less than 1 mm long *F. schoenoides*
- 100a. Spikelets 1-4 per inflorescence, leaves setaceous, glabrous *F. polytrichoides*
- b. Spikelets 5 or more per inflorescence, leaves flat with scabrid margins *F. sp. K*
- 101a. Small annuals, style less than 1 mm long,
glumes less than 2 mm long, stamen 1 (if style and/or glume longer,
then style base with long hairs covering nut) 102
- b. Perennials or large annuals, style either greater than 1 mm long
or glumes greater than 2 mm long, stamens 1-3..... 106
- 102a. Fertile glumes obtuse, involucre bracts much shorter than inflorescence 103
- b. Fertile glumes acute or mucronate, bracts longer than inflorescence 104
- 103a. Inflorescence a single terminal spikelet,
upper glume fringes ciliate, style glabrous *F. distincta*
- b. Inflorescence with 1-12 spikelets, glumes glabrous,
style minutely ciliate..... *F. stenostachya*
- 104a. Style glabrous, nut ornamented with a row of clavate appendages *F. dipsacea*
- b. Style hairy at least at base, nut smooth 105
- 105a. Base of style with long hairs encompassing nut..... *F. velata*
- b. Base of style with short hairs *F. aestivalis*
- 106a. Annual 25 cm or more tall, with broad spongy
stems (1) 2.5 mm wide, style glabrous *F. dolera*
- b. Perennials or annuals less than 25 cm tall, stems stiff, style usually hairy 107
- 107a. Annual with single terminal spikelet,
fertile glumes with an awn about 0.5 mm long *F. adjuncta*
- b. Perennials with 1- numerous spikelets, fertile glumes not awned 108
- 108a. Style base and glume surface ciliate, leaves silky hairy on underside *F. sericea*
- b. Style base and glume surface glabrous,
leaves (if present) glabrous or nearly so 109
- 109a. Nut less than 0.5 mm long, black, style narrow,
ciliate whole length, spikelets numerous *F. caespitosa*
- b. Nut greater than 0.5 mm long, white or brown, other characters not united 110
- 110a. Plants with numerous generally flat leaves,
glumes less than twice as long as broad,
spikelets predominately greater than 6 per inflorescence 111
- b. Plants leafless or with few setaceous leaves,
glumes generally twice as long as broad,
spikelets predominately 1-6 per inflorescence 112
- 111a. Nut trabeculate (lattice-like), base of stem clothed with fibrous
remains of old leaf sheaths; desert plant *F. dichotoma* (desert form)

- b. Nut not trabeculate, base of stem not clothed
with old leaf sheaths; coastal plant *F. cymosa*
- 112a. Spikelets squarrose, fertile glumes 3 mm long or more
with mucro greater than 0.3 mm long, red gland-dotted 2. *F. blakei*
- b. Spikelets rounded, fertile glumes up to 3 mm long,
obtuse or muciculate, not red gland-dotted 113
- 113a. Stems distinctly flattened, nuts white, less than 0.6 mm broad,
involucral bracts much shorter than spikelets; in non-saline soils *F. denudata*
- b. Stems rounded or somewhat flattened, nut pinkish brown or greyish,
greater than 0.6 mm broad, bracts as long or slightly shorter than spikelets;
in saline soils *F. polytrichoides*
- 114a. Majority of inflorescences terminated by a single spikelet
(occasional inflorescence with 2 or 3) 115
- b. Inflorescences with 3 or more spikelets 122
- 115a. Nut distinctly winged, leaf sheaths with broad scarious
margins which continue onto the lamina *F. pachyptera*
- b. Nut not winged (sometimes with 3 apical lobes),
leaf sheath margins (if present) abruptly terminated 116
- 116a. Style greater than 8 mm long, fertile glume greater than 8 mm long 117
- b. Style less than 8 mm long, fertile glume less than 8 mm long 118
- 117a. Nut (including stipe) 2-2.6 mm long with
1 mm long non-angular stipe *F. odontocarpa*
- b. Nut greater than 2.6 mm long, stipe short or ridged or absent *F. squarrulosa*
- 118a. Leaves reduced to loose scarious scales,
spikelets often more than one per inflorescence *F. sp. L (brownii)*
- b. Leaves with distinct lamina, 2 cm or more long, spikelets solitary 119
- 119a. Style less than 3 mm long, glume less than 4.5 mm long,
basal spikelets present *F. spiralis*
- b. Style greater than 3 mm long, glumes greater than 4.5 mm long,
basal spikelets absent 120
- 120a. Annual, leaves contributing less than a third of the bulk of the plant *F. oxystachya*
- b. Perennial, leaves contributing more than a third of the bulk of the plant 121
- 121a. Nut less than 2.5 mm long, glumes less than 6 mm long *F. ovata*
- b. Nut greater than 2.5 mm long, glumes greater than 6 mm long *F. macrantha*
- 122a. Leaves reduced to loose scarious scales 123
- b. Leafy plants 125
- 123a. Spikelets capitate, fertile florets 1-(2) 124
- b. Spikelets generally solitary, fertile florets numerous *F. sp. L (brownii)*

- 124a. Stems scabrid, spikelets
3-6 per inflorescence, 6 mm long *F. arthrostyloides*
- b. Stems smooth, spikelets generally more
than 6 per inflorescence, less than 6 mm long *F. sp G*
- 125a. Glumes hairy on back, style 4-6 mm long..... *F. fusca*
- b. Glumes glabrous, style less than 3.5 mm long 126
- 126a. Leaves with ligule, style hairy at base *F. cinnamometorum*
- b. Leaves without ligule, style glabrous at base 127
- 127a. Annual, leaves strongly falcate, nut abruptly truncate,
conspicuously broader than the short but distinct stipe..... *F. fimbriatylloides*
- b. Perennial, leaves subfalcate, nut not truncate at base *F. eragrostis*

Acknowledgements

I thank the heads of the herbaria BRI, DNA, NSW and PERTH for assisting me with access to their collections. I especially thank G. Leach and C.R. Dunlop for help with the Latin descriptions and for checking the manuscript. K.L. Wilson provided very helpful comments on the key. The efforts of M. Andrews, who executed the line drawings and J. McKinley who capably typed the manuscript, are greatly appreciated.

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